

# 11-MD127

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***Low-saturation, Low-voltage***  
***2 Channels Bi-directional Motor Driver***



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## 11-MD127

# Low-saturation, Low-voltage 2 Channels Bi-directional Motor Driver

### General Specifications

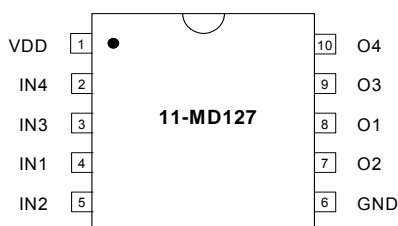
The device is a two-channel low-saturation bi-directional motor driver IC. The design is optimal for 2-dc motor or stepper-motor applications, such as driving shutter/iris on cameras and other motor applications on portable devices.

### Features and Benefits

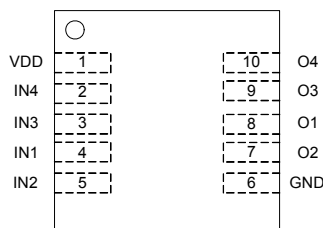
- Low voltage operation (  $V_{DD\ min} = 2.0V$  )
- Low saturation voltage  
( Upper transistor + low transistor residual voltage; 0.46V typ. at 400mA)
- Low input current
- Low operating current
- High output sinking and driving capability
- Ultra-small, thin, highly reliable package (WLCSP, MSOP-10 and DFN-10)
- Thermal shutdown protection

### Pin Assignment

#### MSOP-10

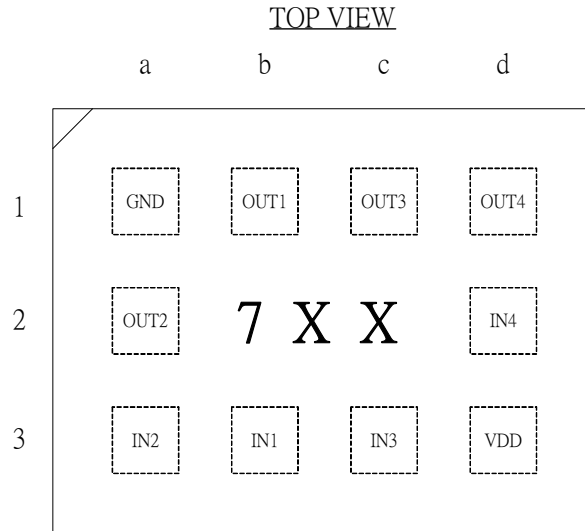


#### DFN-10



PIN NO.	PIN NAME	DESCRIPTION
1	VDD	Power supply pin
2	IN4	Input pin that determines driving mode.
3	IN3	Input pin that determines driving mode.
4	IN1	Input pin that determines driving mode.
5	IN2	Input pin that determines driving mode.
6	GND	Ground pin
7	O2	Output sinking / driving pin
8	O1	Output sinking / driving pin
9	O3	Output sinking / driving pin
10	O4	Output sinking / driving pin.

WLCSP



PIN NO.	PIN NAME	DESCRIPTION
a1	GND	Ground pin
a2	OUT2	Output sinking / driving pin
a3	IN2	Input pin that determines driving mode.
b1	OUT1	Output sinking / driving pin
b3	IN1	Input pin that determines driving mode.
c1	OUT3	Output sinking / driving pin
c3	IN3	Input pin that determines driving mode.
d1	OUT4	Output sinking / driving pin.
d2	IN4	Input pin that determines driving mode.
d3	VDD	Power supply pin

### Absolute Maximum Ratings ( Unless otherwise noted, $T_A = 25^\circ\text{C}$ )

Characteristic	Symbol	Rating	Unit
Supply Voltage	$V_{DD}$	5.5	V
Input Voltage	$V_{IN}$	$V_{DD}+0.4$	V
Maximum Output Current/Channel (DFN,MSOP)	$I_{OUT1}$	400	mA
Maximum Output Current/Channel (WLCSP)	$I_{OUT2}$	250	mA
Power Dissipation (IC)	$P_D$	486	mW
Power Dissipation (PCB mounted)	$P_{D-PCB}$	870	
Operating Temperature Range	$T_{OPR}$	-40 ~ 125	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-65 ~ 150	$^\circ\text{C}$

### Electrical Characteristic (Unless otherwise noted, $T_A = 25^\circ\text{C}$ & $V_{DD} = 3\text{V}$ )

Characteristic	Sym.	Condition	Limit			Unit
			Min.	Typ.	Max.	
Supply Voltage	$V_{DD}$		2.0	3	5.5	V
Supply Current	$I_{DD0}$	$V_{IN1,IN2,IN3,IN4}=0\text{V}$		0.1	10	$\mu\text{A}$
	$I_{DD1}$	$V_{IN1,IN2,IN3,IN4} \neq 0\text{V}$		0.2	0.5	mA
IN 1 / IN 2 / IN3 / IN4 Input Terminal ( $T_J = 25^\circ\text{C}$ )						
Input Voltage "H"	$V_{IH}$	-	$0.5 \cdot V_{DD}$	-	$V_{DD}+0.4$	V
Input Voltage "L"	$V_{IL}$	-	-0.4	-	$0.2 \cdot V_{DD}$	V
Input Current "H"	$I_{IH}$	$V_{IN} = V_{DD}$	-	-	$\pm 5$	$\mu\text{A}$
Input Current "L"	$I_{IL}$	$V_{IN} = 0\text{V}$	-	-	$\pm 5$	$\mu\text{A}$
O1 / O2 / O3 / O4 Output Terminal ( $T_J = 25^\circ\text{C}$ )						
Output Voltage (upper + lower)	$V_{OUT1}$	$I_{OUT} = 100\text{mA}$	-	0.12	0.2	V
	$V_{OUT2}$	$I_{OUT} = 200\text{mA}$	-	0.28	0.4	V
	$V_{OUT3}$	$I_{OUT} = 400\text{mA}$	-	0.46	0.7	V
Thermal Protection Circuit						
Protection Temperature	$T_{TSD}$	$V_{IN1, IN2, IN3, IN4} = \text{H}$		150		$^\circ\text{C}$

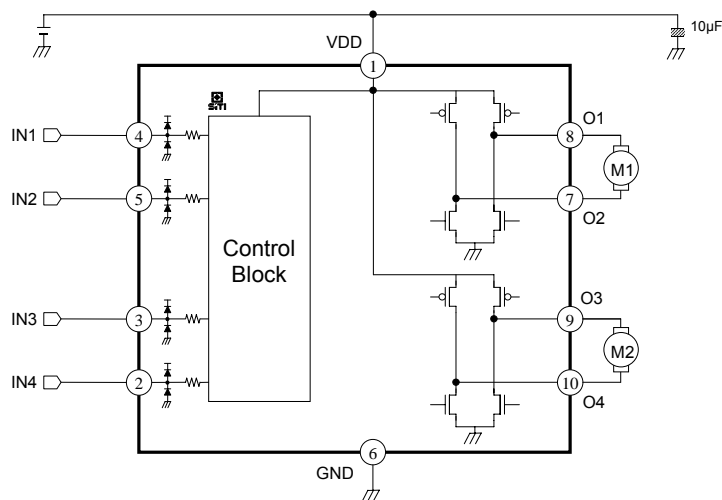
### Truth Table

IN1 / IN3	IN2 / IN4	O1 / O3	O2 / O4	Mode
L	L	OFF	OFF	Standby
H	L	H	L	Forward
L	H	L	H	Reverse
H	H	—	—	Keep the previous mode (Forward / Reverse)

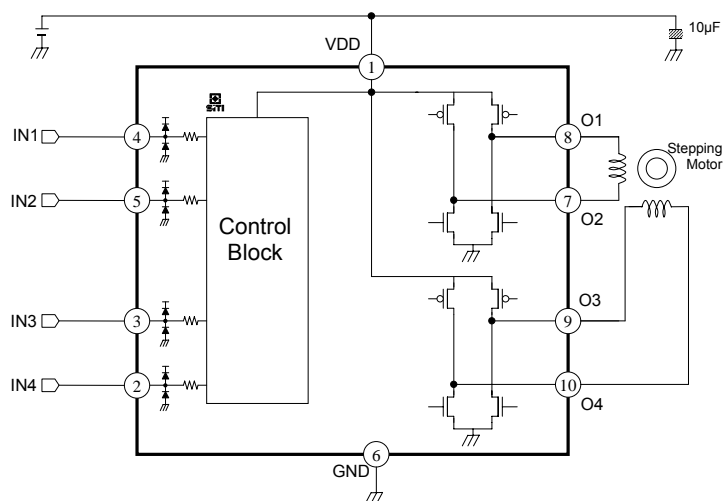
Note: “—” indicates a “don’t care” input.

### Block Diagram & Application Circuit

#### 1. Shutter & Iris application



#### 2. Stepping motor for 1-2 phase excitation



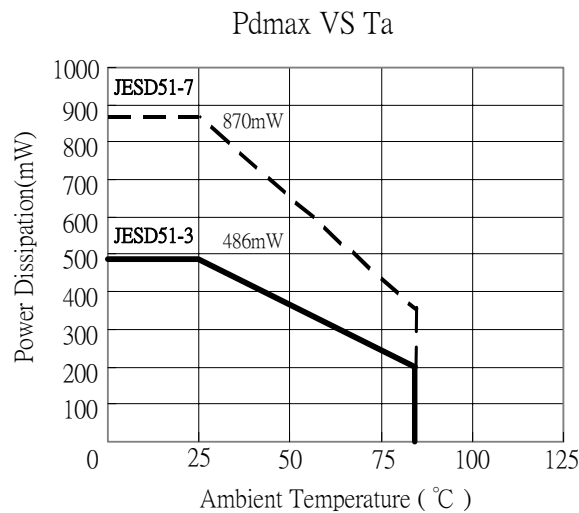


IN1	IN2	IN3	IN4	O1	O2	O3	O4	Notes
L	L	L	L	OFF	OFF	OFF	OFF	Standby
H	L	L	L	H	L	OFF	OFF	1-2 phase excitation
H	L	H	L	H	L	H	L	
L	L	H	L	OFF	OFF	H	L	
L	H	H	L	L	H	H	L	
L	H	L	L	L	H	OFF	OFF	
L	H	L	H	L	H	L	H	
L	L	L	H	OFF	OFF	L	H	
H	L	L	H	H	L	L	H	
H	H	-	-	Keep the previous output state				
-	-	H	H					

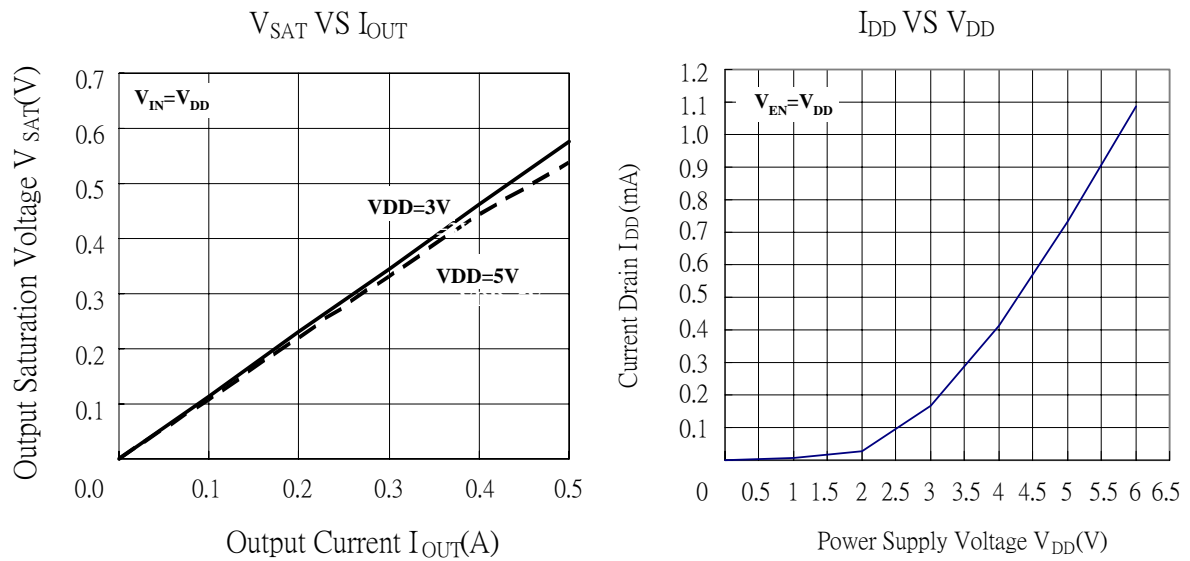
Note: “—” indicates a “don’t care” input.

### Application Notes

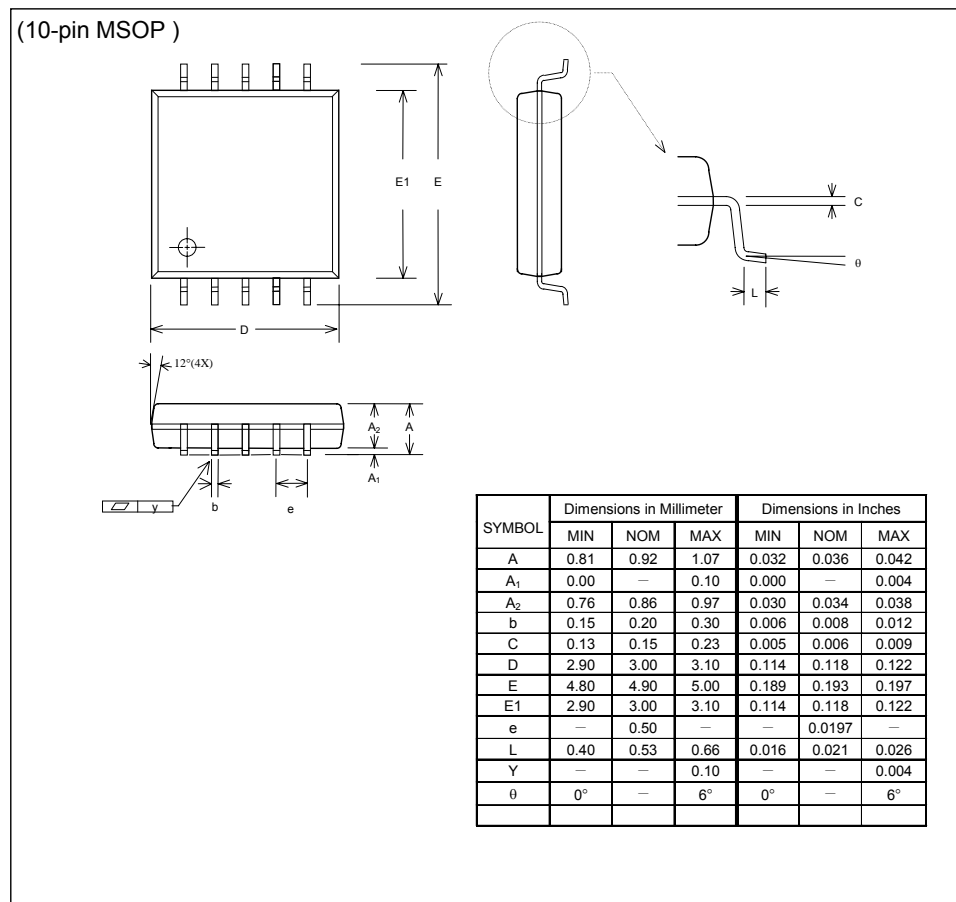
- The power dissipated by the IC varies widely with the supply voltage, the output current, and loading. It is important to ensure the application does not exceed the allowable power dissipation of the IC package. The recommended motor driver power dissipation versus temperature is depicted as follows:



## Typical Performance Curve

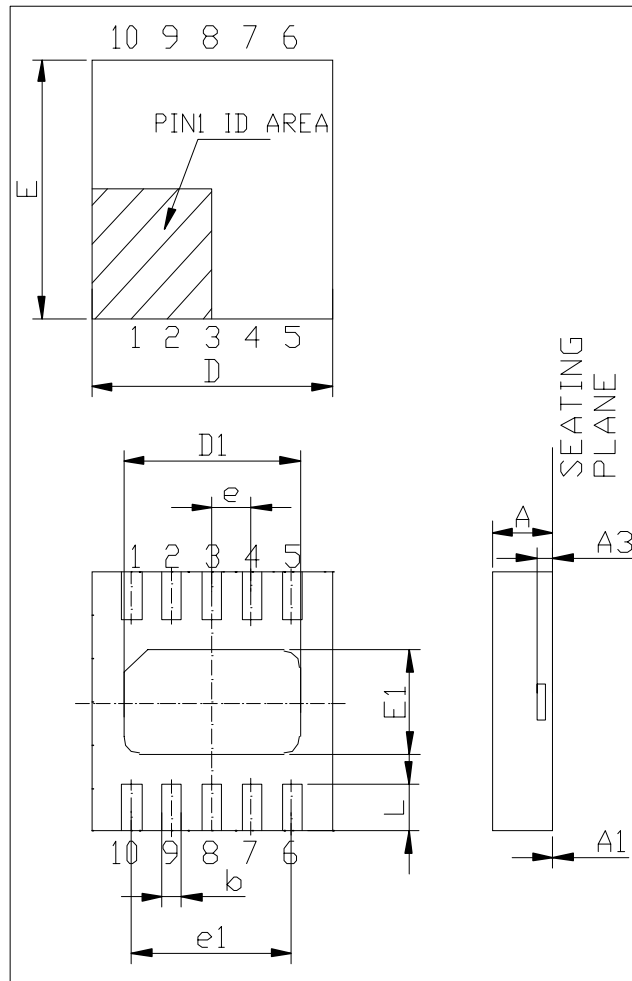


## Package Specifications MSOP-10





DFN-10



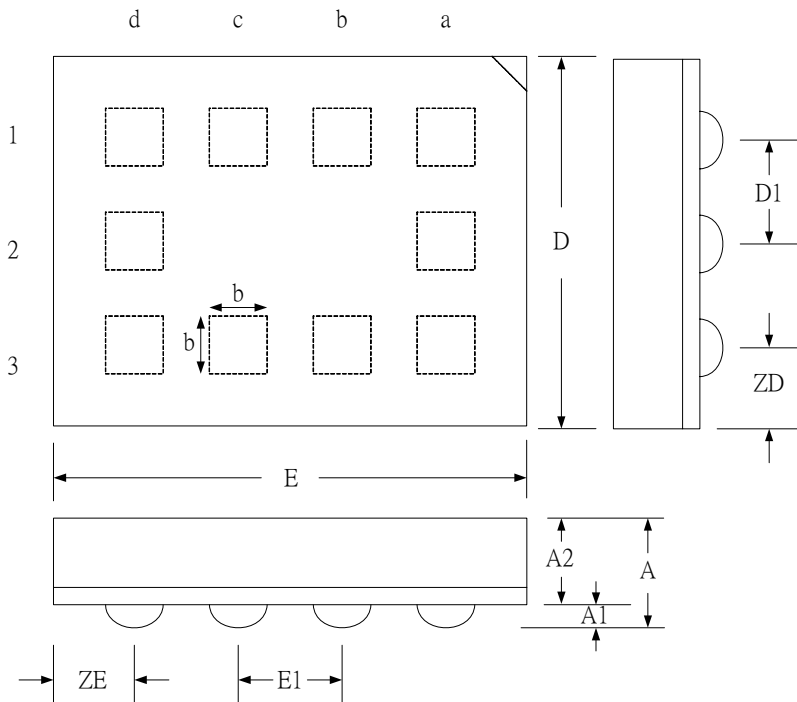
SYMBOL	DIMENSION (mm)			DIMENSION (mil)		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	28	30	32
A1	0.00	0.02	0.05	0	0.8	2
A3	0.203 REF			8 REF		
b	0.18	0.25	0.30	7	10	12
D	2.90	3.00	3.10	114	118	122
D1	2.10	2.20	2.30	83	87	91
E	2.90	3.00	3.10	114	118	122
E1	1.10	1.20	1.30	86	87	91
L	0.45	0.55	0.65	18	22	26
e	0.50 BASIC			20 BASIC		
e1	2.00 BASIC			79 BASIC		



## WLCSP

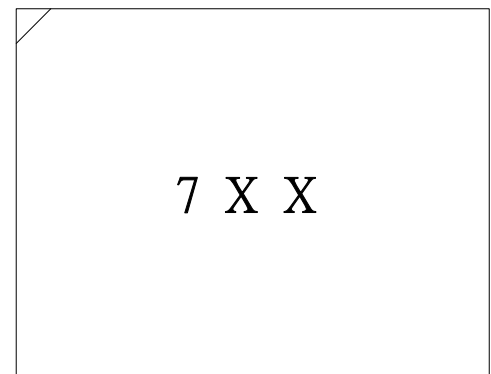
### BOTTOM VIEW

(Ball side)



### TOP VIEW

(Marking side)



XX is the run code.

SYMBOL	DIMENSION (mm)		
	MIN.	NOM.	MAX.
A	0.45	0.50	0.55
A1	0.08	0.10	0.12
A2	0.37	0.40	0.43
b	0.26	0.28	0.30
D	1.40	1.50	1.60
D1	0.50		
E	1.90	2.00	2.10
E1	0.50		
ZD	0.25		
ZE	0.25		



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